

Sorbitol

Often forgotten cause of osmotic diarrhea

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Chronic diarrhea is a common symptom with various causes. We present a case of chronic diarrhea secondary to excessive gum chewing, in which we reflect on the values of both thoughtful information gathering and selective testing. These principles are in the spirit of the Choosing Wisely Canada campaign, which is designed to assist both clinicians and patients in the avoidance of unnecessary tests and treatments while making strategic and effective care choices.

Case

A 59-year-old woman was referred to us with a 1-year history of nonbloody diarrhea and a 4.5-kg weight loss. There was associated crampy abdominal pain, urgency, and incontinence. She had no nighttime bowel movements. She reported a normal appetite, but was avoiding food to prevent what she believed was meal-related diarrhea. However, when we saw her, we determined that the actual timing of the diarrhea was 4 to 6 hours after meals. Her past medical history was notable for a resected glioblastoma 3 years before.

She had traveled to Arizona before the diarrhea began. She received a course of an antibiotic for an unrelated ankle fracture midway through her symptoms without any change.

She had tried various diets but nothing alleviated her symptoms. When we saw her, she was strictly avoiding gluten, sugar, and dairy, despite the lack of any benefit. While seeing a naturopath, she had also tried the Specific Carbohydrate Diet, the Gut and Psychology Syndrome diet, a low FODMAP (fermentable oligo-di-monosaccharides and polyols) diet, an elemental diet (ie, a formula containing polysaccharides, free amino acids, a very low amount of fat, and vitamins and minerals), L-glutamine supplementation, and a probiotic preparation (containing *Bifidobacterium*, *Lactobacillus*, and *Streptococcus* species).

She had a 10 pack-year smoking history and consumed 1 to 2 alcoholic drinks per day. She occasionally smoked medical marijuana, initially prescribed for appetite stimulation during chemotherapy. Her father had a history of both Crohn disease and colorectal cancer.

The patient was initially evaluated by her family physician. Results of laboratory tests included a normal complete blood count, a mildly low potassium level of 3.2 mmol/L, and normal renal, liver, and thyroid function. Her vitamin B12 level and urinalysis results were normal. Celiac serology results were

negative. Serum protein electrophoresis results were normal. Stool test results for culture and sensitivity and *Clostridium difficile* toxin were negative. Stool test results for ova and parasites were positive for *Blastocystis hominis*.

The patient's symptoms did not improve with 2 courses of metronidazole prescribed by her family physician (500 mg twice a day for 7 days each). The patient was then seen by an infectious diseases specialist and was treated with a course of paromomycin (500 mg 3 times a day for 8 days) for *B hominis*. Repeat stool test results for ova and parasites were negative, but her symptoms did not improve.

Before being referred to us, she underwent esophagogastroduodenoscopy, the findings of which were normal aside from mild esophagitis. Duodenal biopsy and colonoscopy findings were normal. Random colon biopsy findings showed a slight increase of intraepithelial lymphocytes in the right colon only.

The patient was then referred to us. Before the office visit, we prescribed a 1-week trial of pancreatic enzymes (75 000 units with each meal); there was no change in her symptoms. On the day we saw her, plain abdominal x-ray scans revealed moderate gas in the colon and a few nondistended small-bowel loops, with a nonspecific gas pattern. As a result of the finding of excessive bowel gas, we questioned her about ingestion of gas-generating substances. This revealed that she was chewing 1 pack of polyol-containing chewing gum per day.

We made a diagnosis of osmotic diarrhea and excessive gas production secondary to gum chewing. After discontinuation of the chewing gum, both her diarrhea and her crampy abdominal pain resolved completely within 48 hours and they have not recurred during 2 years of follow-up.

Discussion

Chronic diarrhea can result from myriad pathologies. The initial evaluation begins with a detailed history. In this case, although the patient believed the diarrhea was meal related, we determined that the diarrhea was occurring 4 to 6 hours after meals, and actually correlated with the time of chewing the gum, which she did several hours after her meals. Because she did not want to be disturbed to go to the bathroom at night, she developed a habit of having her last meal by 6 PM. Curiously, she also decided not to chew gum after that time, even though she had no sense that the gum was a factor.

This case had an unusual number of “red herrings.” She had traveled shortly before the diarrhea started. *Blastocystis* is occasionally thought to be pathogenic in humans and is treated in cases of diarrhea where no other cause is found. She also had a family history of both Crohn disease and colon cancer.

Sorbitol is a hexahydric sugar alcohol used commonly in the food industry as a sweetener and also to improve the texture and shelf-life of foods. Sorbitol is present in many chewing gums and other confections, in some processed foods, and naturally in some foods (apples, apricots, dates, figs, nectarines, peaches, pears, plums, prunes, and raisins). It is also added to some liquid medications as a sweetener.

One stick of Trident gum contains about 1.25 g of sorbitol, and there are 16 to 18 sticks per pack (20 to 22.5 g of sorbitol). Depending on the flavour and format of the Trident product, some also contain maltitol, xylitol, or mannitol, but in smaller amounts than the sorbitol. Sorbitol can cause gastrointestinal symptoms (gas, urgency, bloating, abdominal cramps) in a dose-dependent manner (5 to 20 g per day). Doses of more than 20 g per day can cause diarrhea, with at least 1 case report of associated weight loss.¹

These effects vary from one individual to another. In a metabolic laboratory, participants (N=18) consumed a much higher dose than our patient did (40 g of sorbitol per day) and reported a change in the consistency of bowel movements to “loose” within 1 to 3 hours of ingestion.² Sorbitol increased both stool water content and total stool output per day compared with placebo. Of interest, the amount of participant-reported loose stool associated with sorbitol did not meet the definition of clinically relevant diarrhea (stool output of >250 g per day and bowel movement frequency >3 per day)³ during the study period.

There are several factors that can modulate the laxative effects of sorbitol. Concurrent ingestion of other foodstuffs can affect absorption. Sorbitol absorption was increased when it was administered with rice gruel (ie, extra glucose), suggesting that concurrent ingestion of glucose might reduce the osmotic diarrheal effect of sorbitol.⁴ A study in rats found that possible causes of sorbitol-associated diarrhea include faster intestinal transit, small-bowel malabsorption, incomplete colonic

fermentation of sorbitol into short-chain fatty acids (possibly owing to variations in the microbiome), and slower absorption of breakdown products from the colon.⁴

A recent randomized controlled trial in postsurgical patients (N=82) demonstrated that chewing gum decreased time to passage of first flatus, first bowel motion, and feelings of hunger.⁵ Patients had 1 piece of chewing gum 3 times daily. There were no complications in the chewing gum group. The dose of chewing gum was much lower than the dose known to cause diarrhea or even gastrointestinal side effects. We speculate that in this early postoperative population, who were not ingesting anything else, the lack of attenuating effects of co-ingested substances might have amplified the effects of the chewing gum even at this low dose.

Conclusion

Polyols (sorbitol, mannitol, xylitol, maltol, maltitol, and erythritol) have known laxative properties, but are frequently overlooked as potential causes of diarrhea. Sorbitol, in particular, is present in many chewing gums, mints, and other confections, in some processed foods, naturally in several foods, and in some liquid medications. This patient experienced sorbitol-related diarrhea that resolved upon cessation of the chewing gum. The combination of a detailed history and the use of a simple noninvasive test (2 views of the abdomen) were instrumental in reaching a diagnosis and resolution of symptoms. Had this been done at the start, expensive and invasive investigations might have been avoided. 🌿

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Competing interests

None declared

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